Grassland Bird Surveys in North Valley County, Montana: 2001-2006

Prepared for:

Bureau of Land Management
Glasgow Field Office

Prepared by:

Paul Hendricks, Susan Lenard, Coburn Currier and John Carlson

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Executive Summary

Populations of grassland-associated birds have exhibited the steepest declines of any suite of bird species in North America over the past several decades. Loss of habitat throughout North America, resulting from conversion of native prairie to agricultural production, has been identified as the primary cause of historic grassland bird declines. Large blocks of intact prairie lands remaining in Montana, therefore, provide critically important breeding habitat for many grassland bird species. Bureau of Land Management (BLM) lands, especially in the northeastern and north-central portions of the state, are important breeding habitats for many imperiled grassland species endemic to the Great Plains, as the primary land cover in this area is native mixed-grass prairie. Few areas in the state contain such extensive blocks of intact grasslands.

Recognizing land management decisions can greatly influence native fauna by altering vegetation structure and plant composition, biologists in the Glasgow Field Office of the BLM initiated a grassland bird project to identify the diversity and abundance of prairie birds on BLM lands in north Valley County. The degree to which livestock grazing, the Bureau's primary land management activity in the county, can influence native bird species varies widely and is dependent upon many factors. To better understand the impact of different grazing histories on presence and relative abundance of native prairie bird species, fixed-radius point counts were randomly placed across BLM lands in north Valley County in areas with native grassland plant cover. Transects consisting of three point locations were surveyed using standard avian point-count protocols to document bird species abundance and diversity across pastures with differing grazing histories. The project, which began in 2001, evolved into a multi-year inventory, and has completed six consecutive years of point counts. No other project focused on grassland birds in Montana has gathered consistent data at the same locations for this length of time. The information gathered during this project will provide critical information on grassland bird/grazing dynamics and the current status of prairie birds in this increasingly rare ecosystem. This report summarizes bird species presence and relative abundance during the first six years of inventory, and examines some factors that may affect bird presence and abundance on the north Valley County grassland landscape.

Seventy-five species of birds were recorded on 1203 avian point counts (63 - 69 transects run each year) in north Valley County during the early summer months of 2001 through 2006. Twenty-nine species (38.7% of the total) have been recorded on at least one point count every year, and two additional species were recorded on point counts in five of the six years of surveys. These 31 bird species represent nearly the full suite likely to regularly breed in grassland habitat in this region of Montana.

Sixteen bird species recorded on north Valley County point counts are Montana Species of Concern, including seven which are endemic to the Northern Great Plains: Ferruginous Hawk (*Buteo regalis*), Long-billed Curlew (*Numenius americanus*), Sprague's Pipit (*Anthus spragueii*), Lark Bunting (*Calamospiza melanocorys*), Baird's Sparrow (*Ammodramus bairdii*), McCown's Longspur (*Calcarius mccownii*), and Chestnut-collared Longspur (*Calcarius ornatus*). Other Species of Concern also recorded on point counts included American White Pelican (*Pelecanus erythrorhynchos*), Greater Sage-Grouse (*Centrocercus urophasianus*), Swainson's Hawk (*Buteo swainsoni*), Franklin's Gull (*Larus pipixcan*), Common Tern (*Sterna hirundo*), Loggerhead Shrike (*Lanius ludovicianus*), Brewer's Sparrow (*Spizella breweri*), Grasshopper Sparrow (*Ammodramus savannarum*), and Bobolink (*Dolichonyx oryzivorous*). Nine Species of Concern were recorded every year, of which three (Sprague's Pipit, Baird's Sparrow, Chestnut-collared Longspur) occurred annually on 32% or more of all points.

Among the six years of study, birds varied in both number of individuals counted and percentage of point counts on which they occurred. Preliminary

analyses for seven Species of Concern indicate that the number of point counts on which they are detected may be strongly correlated with the mean number of individuals recorded per point count, and that both metrics provide a long-term means of tracking general trends across a large landscape, such as north Valley County. However, it seems probable that conditions at the local landscape scale that affect vegetation structure have a strong influence on the number of individuals that settle at any specific location. Identifying these conditions will aid managers in developing management activities that favor the conservation of grassland birds. Some conditions, however, may be beyond the ability of local land managers to control. Preliminary analyses also indicate that annual variation in abundance of some grassland bird Species of Concern is strongly related to total April - May precipitation.

More than 85% of the total individuals recorded during the six-year inventory were represented by 12 species, seven of which are state Species of Concern. Six of these are species endemic to the Northern Great Plains. Their presence and relative abundance reflects the uniqueness and importance of north Valley County; few places remain in the Northern Great Plains that supports such a composition of species. Their abundance also reflects a landscape diverse in vegetation characteristics, as each species requires unique habitat elements for breeding and foraging. Chestnut-collared Longspurs and Sprague's Pipits require areas with moderate levels of grass cover and litter, for example, while Baird's Sparrows require dense grass and litter, and McCown's Longspurs require sparse grass and bare ground. In addition to habitat availability, the condition is also critical. A heterogeneous prairie mosaic can support a greater number of grassland endemics. Although once plentiful across the Northern Great Plains, large blocks of intact native prairie habitat are now rare. Protecting these lands from conversion and other activities in conflict with historic disturbances (e.g. grazing and fire regimes that mimic the natural frequency and intensity) is critical to maintaining native prairie capable of supporting a diverse species assemblage. Without this protection, many of these endemics would likely disappear from the landscape.

Acknowledgements

Considerable thanks and appreciation to Dave Waller, former Glasgow BLM Field Office wildlife biologist, and Roxanne Falise, former BLM State Wildlife Program Director, for recognizing the importance of this project and providing the funds to make it possible. We also thank Bryce Maxell, Montana Natural Heritage Program, for negotiating continued support for the study, and suggesting ways of improving the procedures.

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INTRODUCTION

In recent decades, grassland bird populations have exhibited range-wide declines (Knopf 1994, Peterjohn and Sauer 1999, Vickery et al. 1999). Historical conversion of the landscape to agricultural cropland is clearly the greatest contributing factor to loss of suitable habitat (Samson and Knopf 1994, Fitzgerald et al. 1999, Knapp et al. 1999, Blann 2006). Habitat loss resulting from fragmentation and conversion for agricultural, industrial, and human habitation uses continues, contributing to further grassland bird population declines. Additionally, a variety of land management practices in areas of remaining intact prairie can negatively impact prairie bird populations (Saab et al. 1995). Worldwide, grasslands are recognized as the most imperiled of terrestrial landscapes (Samson and Knopf 1996).

Individual grassland bird species select suitable habitat from a matrix of habitats available across the prairie landscape. Historically, each species probably exhibited pronounced fluctuations in local abundance as vegetation conditions changed in response to drought, fire, and grazing by bison and locust. The extermination of bison, the extinction of Rocky Mountain locust, and aggressive control of fire during the settlement of the Great Plains profoundly altered the composition of grasslands (Knapp et al. 1999).

Since individual prairie bird species select appropriate habitat for breeding and nesting from a narrow range of vegetation conditions within a heterogeneous matrix, current grassland management practices can impact different species in a myriad of ways. Grassland associated species favoring vegetation structure and composition promoted by human activities (managed grazing, fire suppression, and annual mowing) have generally benefited while species requiring a more natural disturbance regime (periodic fire and historic grazing patterns) have generally experienced declines (Sauer et al. 2005). Because of the widespread loss of native grasslands, remaining tracts of prairie grassland vegetation are increasingly valuable for native bird species. Understanding how grassland birds respond to different grazing practices and histories on a large landscape managed for multiple-use can contribute to the conservation of prairie bird species range-wide. Unlike other areas in the Northern Great Plains, populations of many native grassland bird species have been relatively stable in northeastern Montana over the last 40 years (Sauer et al. 2005). Thus, this region is ideal for exploring the response of native bird species to different grazing histories and grazing allotment size. Neither of these disturbances is currently well understood, but both have obvious implications for grassland bird conservation. Furthermore, having long-term grazing histories for grazing allotments allows for an analysis of past management practices and their effects on current grassland bird abundance and habitat selection.

The purpose of this report is to provide an update of project activities during 2001 - 2006, supplementing Lenard et al. (2006). Additionally, this report identifies the regular grassland-breeding bird community in north Valley County, provides a preliminary assessment of the status of a suite of Montana Species of Concern that are members of this community, identifies the possible role spring precipitation plays in fluctuations of these species, and explores potential explanations for the patterns so far identified.

Study Area

Located on the Northern Glaciated Plains, the study area lies in the northern half of Valley County in northeastern Montana (Figure 1). The county lies adjacent to the border with Saskatchewan, Canada and is bounded by the Missouri River to the south, Phillips County to the west and Daniels and Roosevelt Counties to the east. The project area includes BLM lands north of Glasgow, east of Opheim and west of Valleytown. Bitter Creek, Frenchman Creek, Crow Creek, Rock Creek, Willow Creek, and Buggy Creek, all located generally within the project boundaries, drain to the Milk River. The Bitter Creek Wilderness Study Area, nearly 60,000 acres of highly eroded badlands, recognized for its unique, isolated and unspoiled nature, is situated approximately at the project center. To the east and adjacent to the project area is Dry Fork Creek, primarily contained within a large block of Montana Department of Natural Resources Conservation lands. Cooper et al. (2001) describe this area as possibly the best intact site of a rare mid-grass (northern porcupine grass-thickspike wheatgrass) prairie remaining in the United States.

The physical characteristics of this area are similar to the surrounding lands. Glacial till and outwash cover the terrain as the area's gently rolling landscape was scoured by at least two glacial events. The most common substrate in the project area is clay shale, marine in origin and dark grey in color (Cooper et al. 2001). The local climate is considered semi-arid with precipitation of approximately 10 to 14 inches per year, much of it falling as early summer rains in late May and early June. Winters are generally frigid while the summers can be hot, punctuated by hail-producing thunderstorms that can result in flash floods. The county's greatest topographic variation occurs at its eastern half; the highest elevation of approximately 3,300 feet occurs near Opheim to the north, while the lowest elevation of approximately 2,000 feet occurs where the Missouri River leaves the county to the south. Specific point locations on the project ranged from 2,448 to 3,049 feet in elevation. While the primary landcover within the project boundary is native mixed-grass prairie, the majority of the surrounding land has been cropped for agricultural production. This area is significant as it encompasses the most extensive remaining piece of intact prairie land in Montana. For a more detailed description of vegetative communities and distinguishing attributes specific to the study area see Cooper et al. (2001).

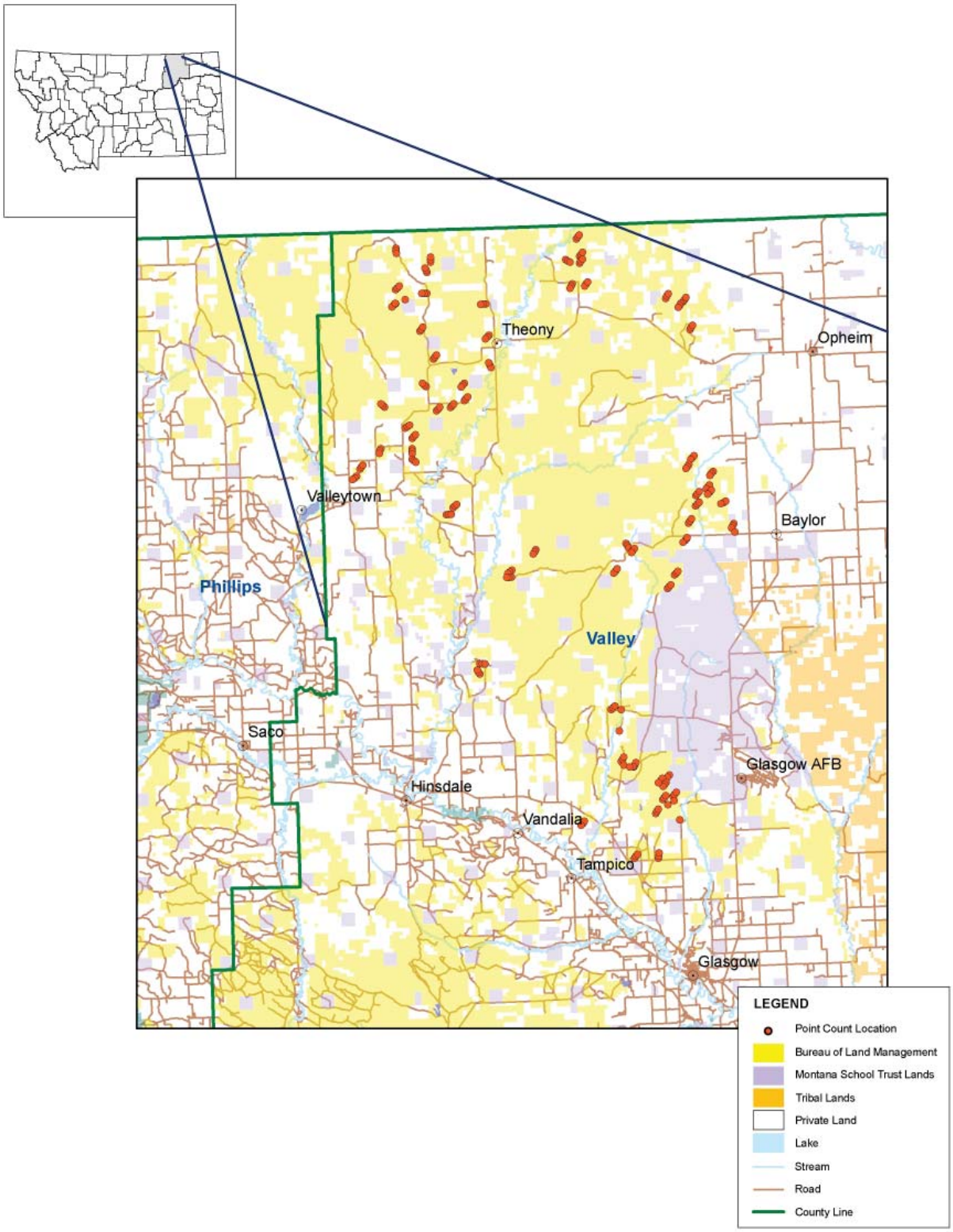

Figure 1. Map of the north Valley County Study Area with point-count locations.

METHODS

Point Selection and Project Design

The project was limited to BLM lands in north Valley County. Initial steps involved using a Geographic Information System (GIS) to stratify the area under consideration by soil type using the Soil Survey Geographic Database (SSURGO). Areas classified as having silty soils, those that support growth of native grass species important to grassland birds, were used to delineate the area within which inferences were to be made (i.e., the target population). Areas classified as high clay content soils were eliminated from survey as the vegetation associated with clay soils does not generally support grassland birds. Eliminating high-clay soils effectively eliminated the badlands area surrounding Bitter Creek located at the center of the study area. However, some areas on the western portion of the project ended up being located in areas with high-clay soil.

Within the area targeted for sampling, 120 bird survey point locations were randomly generated from which transects would originate for the project. Originally, each point-count transect was to consist of four points. However, since the original point locations were random, it would have been difficult, if not impossible, to generate a line of four points within one pasture (generally a quarter-section) given the 300 meter minimal distance required between points for standard point count protocol (Hutto et al. 1986, Drapeau et al. 1999). Thus, the scope of the project was changed to accommodate transect lines consisting of three points. After locating the randomly-generated point on the ground via a GPS unit, the second and third points were identified by field personnel walking no less than 300 meters from each previous point, resulting in a total straight line transect length of approximately 600 meters. Each of the three points defined the spot at which each point count survey was conducted. Coordinates for all points were recorded on GPS units for finding survey locations in subsequent years. The second and third points in each transect were generally established to the northeast if there was room to do so and remain in the same pasture as the original point. If this was not the case, then the points were oriented to the southwest of the original point. Efforts were made to keep all three points within the same pasture/grazing treatment. This sometimes necessitated placing the second and third points on opposite sides of the first point (one to the northeast and one to the southwest). If a northeast-southwest placement was not possible, then a northwest-southeast orientation was followed, in whichever direction allowed the points to be contained within one pasture. Inadvertently, and due to time constraints at the start of the project, nine transects ended up with points not wholly contained within one pasture. One transect includes one point-count circle entirely in a different pasture; 7 transects include all center points in the same pasture, but one of the 100 m radius point-count circles overlapping an adjacent pasture; and 2 transects include one point with the center in an adjacent pasture but a portion of the 100 m point-count circle within the first pasture.

During the first field season (2001) the points were divided among two field personnel such that points west of the Willow Creek/Bitter Creek area were assigned to one observer while those on the east were assigned to the second observer. The points ultimately surveyed were selected across each region based upon accessibility and distribution. Points were generally considered accessible if they could be reached by vehicle (on existing two-tracks) to within a walking distance of approximately one mile. Effort was also made to survey both the eastern and western points such that the maximum north-south distribution was accomplished. Field personnel attempted to maximize the number of point counts conducted in a day; 3 - 4 transects (9 - 12 points) were targeted each morning.

Point counts were conducted by Paul Hendricks and John Carlson during the first three years of survey (Table 1). In year four (2004), the point counts were conducted by four individuals: Paul Hendricks, John Carlson, Susan Lenard, and Coburn Currier. In years five and six (2005

- 2006), three individuals conducted the counts: Hendricks, Lenard, and Currier. During the initial year (2001), 69 of the 120 original random points were surveyed, with three points per transect for a total of 207 point counts. These original 69 transects became the targeted transects for survey each subsequent year through 2006. Although we attempted to conduct point count surveys on all points every year, weather conditions and time restrictions prevented this from occurring some years.

Survey Timing

Across all years, point-count survey work commenced on or after May 21 and was completed on or before July 12; effort was made each year to complete all counts by the end of June. Except for two transects during 2001, point counts began as early as sunrise and were completed by 10:37. During the start of the project, Paul Hendricks observed the level of vocalization of prairie birds in the evening hours appeared comparable to the early morning hours and conducted six point counts (two transects) in the evening hours, between 19:00 and 19:40. Subsequently, the decision was made to restrict surveys to the morning hours, although studies in grasslands elsewhere (Swengel and Swengel 2000) indicate that no single period of the day is optimal for detecting all bird species.

Avian Point Count Methodology

All point counts were ten minutes in duration and conducted within approximately six hours following sunrise (and generally not earlier than 05:50). During each point count, birds observed during time intervals of 0 - 3 minutes,

Table 1. Summary of observers, number of transects, and number of point counts each year

Year	Total Number of Transects	Total Number of Point Counts	Observer	Number of Point Counts by Observer
2001	69	207	Paul Hendricks	117
			John Carlson	90
2002	69	207	Paul Hendricks	117
			John Carlson	90
2003	63	189	Paul Hendricks	117
			John Carlson	72
2004	65	195	Paul Hendricks	93
			John Carlson	18
			Susan Lenard	45
			Coburn Currier	39
2005	66	198	Paul Hendricks	69
			Susan Lenard	81
			Coburn Currier	48
2006	69	207	Paul Hendricks	72
			Susan Lenard	63
			Coburn Currier	72

3 - 5 minutes, and 5 - 10 minutes were recorded separately. All birds detected visually and/or aurally within a visually-estimated 100-meter radius circle surrounding the center point were included in the tally. Each individual species was documented with the appropriate 4-letter AOU code, abundance noted, and identified as within the 100-meter circle, on the edge, or outside of the circle. Birds that flew over the circle and did not land during the count were recorded as flyovers. Counts were not conducted during continuous rain or winds generally exceeding about 15 mph.

The correlation of annual abundance and the percentage of point counts on which a given species occurs is strong (Spearman rank correlations: $r_s = 0.600 – 0.912$, $P = 0.175 – 0.017$), for seven passerine Species of Concern recorded annually in north Valley County. Thus, it is still possible to infer the general trend of species abundances in this landscape, similar to results reported in analysis of Breeding Bird Survey data (Bart and Klosiewski 1989), even if two observers do not detect equally the number of individuals of each species on point counts.

Vegetation Measurement Protocols

Vegetation measurements were recorded at each bird point-count location. For these purposes, the point location defined the center of a 25-meter diameter circle in which maximum height, plant frequency, litter depth, and ground cover were recorded. Ground cover measurements were taken along a 50-meter straight line inscribed in each circle, with end points at opposite cardinal compass directions. At each meter along this transect, the ground cover type was recorded as bare ground (including rock) or non-bare ground (grass/forb/clubmoss). The center (the original point-count location) was not included in the ground cover measurements.

An index of vegetation density was recorded at points in each of the 4 cardinal directions 25 meters from the center of the point-count circle. At each of these points, a one-meter rod was placed perpendicular to the ground, and all vegetation contacts with the rod were recorded in one decimeter increments (0-1 dm, 1-2 dm, or >2 dm). The plant contacts were recorded as either grass or forb and alive or dead. For maximum height, the height of the tallest plant within a one-meter radius of each point was recorded to the nearest centimeter. Litter depth, to the nearest millimeter, was also recorded at each of the four points where the one-meter stick was placed perpendicular to the ground.

Results and Discussion

One thousand two hundred and three avian point counts were conducted in north Valley County from 2001 through 2006 (Table 1). Seventy-five species of birds were detected at least once on point counts, and two species were new in 2006: American White Pelican (*Pelecanus erythrorhynchos*) and Redhead (*Aythya americana*). For a list of species detected through 2005, see Lenard et al. (2006). During the point counts of 2006, 45 species were detected.

Of the total species detected on all point counts, 16 are Montana Species of Concern (Table 2): American White Pelican, Greater Sage-Grouse (*Centrocercus urophasianus*), Swainson's Hawk (*Buteo swainsoni*), Ferruginous Hawk (*Buteo regalis*), Long-billed Curlew (*Numenius americanus*), Franklin's Gull (*Larus pipixcan*), Common Tern (*Sterna hirundo*), Loggerhead Shrike (*Lanius ludovicianus*), Sprague's Pipit (*Anthus spragueii*), Brewer's

Table 2. Bird species of conservation concern occurring on point counts in north Valley County during 2001-2006.

Common Name	Scientific Name	Global and State Ranks[a]	BLM Status[b]	PIF Rank[c]
American White Pelican	*Pelecanus erythrorhynchos*	G3/S3B		III
Greater Sage-Grouse	*Centrocercus urophasianus*	G4/S3B	Sensitive	I
Northern Harrier	*Circus cyaneus*			III
Swainson's Hawk	*Buteo swainsoni*	G5/S3B	Sensitive	
Ferruginous Hawk	*Buteo regalis*	G4/S3B	Sensitive	II
Killdeer	*Charadrius vociferous*			III
Willet	*Catoptrophorus semipalmatus*		Sensitive	III
Long-billed Curlew	*Numenius americanus*	G5/S2B	Sensitive	II
Marbled Godwit	*Limosa fedoa*		Sensitive	
Wilson's Phalarope	*Phalaropus tricolor*		Sensitive	III
Franklin's Gull	*Larus pipixcan*	G4G5/S3B	Sensitive	II
Common Tern	*Sterna hirundo*	G5/S3B		II
Loggerhead Shrike	*Lanius ludovicianus*	G4/S3B	Sensitive	II
Short-eared Owl	*Asio flammeus*			III
Sprague's Pipit	*Anthus spragueii*	G4/S2B	Sensitive	I
Clay-colored Sparrow	*Spizella pallida*			III
Brewer's Sparrow	*Spizella breweri*	G5/S2B	Sensitive	II
Lark Sparrow	*Chondestes grammacus*			III
Lark Bunting	*Calamospiza melanocorys*	G5/S3B		II
Grasshopper Sparrow	*Ammodramus savannarum*	G5/S2B		II
Baird's Sparrow	*Ammodramus bairdii*	G4/S2B	Sensitive	I
McCown's Longspur	*Calcarius mccownii*	G5/S2B	Sensitive	II
Chestnut-collared Longspur	*Calcarius ornatus*	G5/S3B	Sensitive	II
Bobolink	*Dolichonyx oryzivorous*	G5/S2B		III
Red-winged Blackbird	*Agelaius phoeniceus*			III
Brewer's Blackbird	*Euphagus cyanocephalus*			III

[a] **Appendix A**

[b] **BLM Status**

Sensitive: species proven imperiled in at least part of their ranges, and are documented to occur on BLM lands.

[c] **Montana Partners in Flight Priority Levels**

I Conservation Action: These are species for which Montana has clear obligations to implement conservation.

II Monitoring Species: Montana has a high responsibility to monitor the status of these species, and/or to design conservation actions.

III Local Concern: Presence of these species may serve as added criteria in the design and selection of conservation or monitoring strategies (Casey 2000).

Sparrow (*Spizella breweri*), Lark Bunting (*Calamospiza melanocorys*), Grasshopper Sparrow (*Ammodramus savannarum*), Baird's Sparrow (*Ammodramus bairdii*), McCown's Longspur (*Calcarius mccownii*), Chestnut-collared Longspur (*Calcarius ornatus*), and Bobolink (*Dolichonyx oryzivorous*) (MTNHP and MFWP 2006). Seven of these species are endemic to the Northern Great Plains: Ferruginous Hawk, Long-billed Curlew, Sprague's Pipit, Lark Bunting, Baird's Sparrow, McCown's Longspur, and Chestnut-collared Longspur (Samson and Knopf 1996).

Nine additional species recorded on the project are secondary, more widespread species of the prairie: Sharp-tailed Grouse (*Tympanuchus phasianellus*), Northern Harrier (*Circus cyaneus*), Swainson's Hawk, Upland Sandpiper (*Bartramia longicauda*), Short-eared Owl (*Asio flammeus*), Horned Lark (*Eremophila alpestris*), Vesper Sparrow (*Pooecetes gramineus*), Bobolink, and Western Meadowlark (*Sternela neglecta*) (Samson and Knopf 1996). Ten species recorded during the project, and not currently listed as state Species of Concern, are identified either as BLM Sensitive Species (Table 2) or as Species of Conservation Concern in the Montana Partner's in Flight Draft Bird Conservation Plan for Montana (Casey 2000, BLM 2004).

Twenty-nine (38.7%) of the 75 bird species documented on point counts during 2001 through 2006 were recorded every year (Table 3). This suite of species probably includes most or all of those that breed regularly and occur widely in grassland habitats in north Valley County. These 29 species also include nine Montana Species of Concern and three others that are BLM Sensitive Species. Thus 41.4% of the species documented every year on point counts in north Valley County are of designated conservation concern. Sparrows and buntings comprise the largest group of species (8) that were documented annually, and six (75%) of these are Montana Species of Concern. Eight of the nine annually-occurring state Species of Concern are passerines, the ninth is the Long-billed Curlew, a grassland-nesting shorebird.

Some of the species documented annually on point counts (Table 3) consistently appear each year on a very small percentage of the total point counts, and probably occur because of the presence of some rare habitat feature (like a tree for Eastern Kingbird (*Tyrannus tyrannus*), or a pond or wetland for species like Northern Shoveler (*Anas clypeata*), Wilson's Phalarope (*Phalaropus tricolor*), and Red-winged Blackbird *(Agelaius phoeniceus*)) on or near a point-count circle. Killdeer (*Charadrius vociferous*), Willet (*Catoptrophorus semipalmatus*), and Marbled Godwit (*Limosa fedoa*) are often drawn to observers, thus the percentage of point counts on which they appear is probably an over-estimate of their relative abundance. Nevertheless, nests of all three have been found while traversing point-count transects (P. Hendricks personal observation). In contrast to the three shorebirds, Western Meadowlark appears to be wary of observers, and their relative abundance is perhaps a slight underestimate, even though they are consistently one of the most abundant species each year.

For the Species of Concern, some are among the most abundant and wide-spread birds on the north Valley County point counts. The five most commonly-encountered species include Horned Lark, Sprague's Pipit, Baird's Sparrow, Chestnut-collared Longspur, and Western Meadowlark, each of which occurred on at least 32.4% of all point counts each year (Table 3, Figure 2); Sprague's Pipit, Baird's Sparrow, and Chestnut-collared Longspur are state Species of Concern. Other state Species of Concern, such as Brewer's Sparrow and Bobolink, are among the least abundant and widespread.

Local climate conditions may play a role in annual variations in the abundance of grassland bird species in north Valley County. In particular, the amount of April and May precipitation appears to affect the abundance of some Species of Concern, such as Sprague's Pipit, Baird's Sparrow, and Bobolink (Table 4, Figure 3). Total precipitation for these two months was chosen as most likely to influence vegetation conditions birds will find when they commence nesting in this region (Davis 2003). Even with a small sample size of years,

Table 3. Bird species detected every year (2001-2006) on north Valley County, Montana point counts. Montana SOC species are indicated by an asterisk, BLM Sensitive Species by a plus symbol. Number of point counts: 189 - 207; number of transects: 63 - 69.

Species	% Points detected (range)	% Transects detected (range)
Waterfowl		
Mallard	1.0 – 4.8	3.0 – 13.0
Northern Shoveler	<1.0 – 1.9	1.4 – 5.8
Diurnal Raptors		
Northern Harrier	2.9 – 10.1	8.7 – 26.1
Upland Game Birds		
Ring-necked Pheasant	<1.0 – 3.0	1.4 – 5.8
Sharp-tailed Grouse	1.4 – 2.9	4.3 – 8.7
Shorebirds		
Killdeer	4.1 – 7.9	9.2 – 20.6
Willet+	6.8 – 13.1	14.3 – 33.3
Upland Sandpiper	1.0 – 3.5	2.9 – 9.1
Long-billed Curlew*+	12.6 – 22.2	27.0 – 40.9
Marbled Godwit+	10.6 – 25.3	21.7 – 50.0
Wilson's Phalarope+	<1.0 – 7.2	1.4 – 15.4
Pigeons/Doves		
Mourning Dove	1.5 – 6.3	3.1 – 14.5
Flycatchers		
Eastern Kingbird	<1.0 – 2.4	1.4 – 7.2
Swallows		
Barn Swallow	<1.0 – 2.9	1.4 – 8.7
Larks		
Horned Lark	76.8 – 82.1	90.5 – 98.6
Pipits/Wagtails		
Sprague's Pipit*+	60.9 – 82.1	84.1 – 98.5
Sparrows/Buntings		
Brewer's Sparrow*+	1.4 – 4.8	4.3 – 10.1
Vesper Sparrow	18.7 – 29.6	36.4 – 50.8
Lark Bunting*	8.7 – 40.1	15.9 – 55.1
Savannah Sparrow	7.2 – 14.8	15.2 – 31.7
Grasshopper Sparrow*	6.7 – 22.2	15.9 – 42.0
Baird's Sparrow*+	32.4 – 54.0	49.3 – 69.8
McCown's Longspur*+	14.0 – 31.4	26.1 – 50.7
Chestnut-collared Longspur*+	81.2 – 87.0	87.0 – 95.7
Blackbirds		
Bobolink*	1.0 – 6.3	2.9 – 11.1
Red-winged Blackbird	2.4 – 6.7	7.2 – 16.9
Western Meadowlark	74.9 – 96.6	94.2 – 100.0
Brewer's Blackbird	4.3 – 10.6	10.1 – 27.5
Brown-headed Cowbird	10.1 – 23.7	26.1 – 50.7

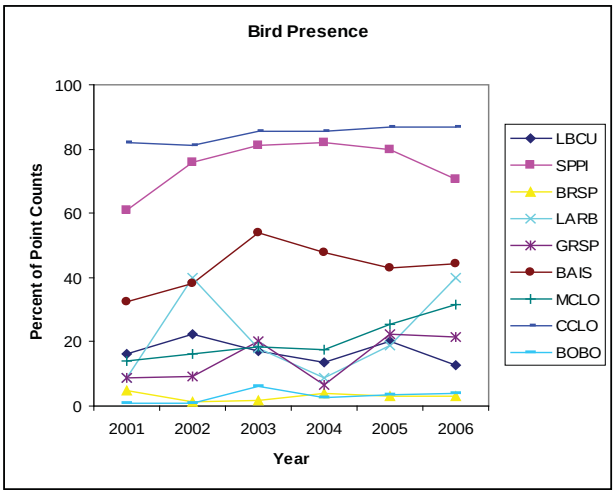

Figure 2. Occurrence of nine Montana Species of Concern on point counts in north Valley County during 2001 - 2006. Long-billed Curlew (LBCU), Sprague's Pipit (SPPI), Brewer's Sparrow (BRSP), Lark Bunting (LARB), Grasshopper Sparrow (GRSP), Baird's Sparrow (BAIS), McCown's Longspur (MCLO), Chestnut-collared Longspur (CCLO), and Bobolink (BOBO). Annual number of counts varied from 189 to 207.

strong positive correlations exist between April - May precipitation and the annual percentage of point counts on which these three species occur. Interestingly, these three species associate with sites where vegetation is taller and denser than average (Sutter 1997, Davis et al. 1999, Johnsgard 2001, Dieni and Jones 2003, Appendix B).

Both longspur species showed a pattern similar to each other, with peak abundance at middle levels of spring precipitation; of the two, McCown's Longspur abundance declined more steeply at high levels of spring precipitation. This abundance pattern might also be expected, as both species associate with sites where the vegetation is relatively low in height and low to moderate in density. Long-billed Curlew showed a moderately negative correlation of abundance with spring precipitation. This pattern, too, could be anticipated, since this species selects sites with low-stature grass in which to nest (Johnsgard 2001).

The three remaining annually-occurring Species of Concern (Table 3) showed the weakest abundance correlations with April and May precipitation: r_s = 0.029 (P = 0.919) for Brewer's Sparrow, r_s = -0.324 (P = 0.564) for Lark Bunting, and r_s = 0.029 (P = 0.919) for Grasshopper Sparrow. The association of Brewer's Sparrow with shrub cover (Best 1972, Bock and Bock 1987, Paige and Ritter 1999) might contribute to the weak abundance-precipitation relationship, as the short-term structural response of shrubs to precipitation is likely minimal. Lark Bunting is more nomadic across a large region than the other species, and dramatic population fluctuations in north Valley County (Figure 2) are probably in part a response to drought conditions elsewhere (Yackel Adams et al. 2006, Lenard et al. 2006); Lark Bunting is also sometimes associated with the presence of a low density of shrubs (Feist 1968, Bock and Bock 1987, Johnsgard 2001, P. Hendricks personal observation). The extremely weak relationship between Grasshopper Sparrow abundance and spring precipitation was

Table 4. April – May precipitation near Opheim and percent occurrence on point counts of nine Montana bird Species of Concern in north Valley County

	2001	2002	2003	2004	2005	2006
April-May precipitation (inches)	1.89	1.14	4.14	3.93	2.57	2.72
Long-billed Curlew	16.4	22.2	16.9	13.8	20.2	12.6
Sprague's Pipit	60.9	75.8	81.0	82.1	79.8	70.5
Brewer's Sparrow	4.8	1.4	1.6	4.1	3.0	2.9
Lark Bunting	8.7	40.1	18.0	8.7	18.7	40.1
Grasshopper Sparrow	8.7	9.2	20.1	6.7	22.2	21.7
Baird's Sparrow	32.4	38.2	54.0	47.7	42.9	44.4
McCown's Longspur	14.0	16.4	18.5	17.4	25.3	31.4
Chestnut-collared Longspur	82.1	81.2	85.7	85.6	86.9	87.0
Bobolink	1.0	1.0	6.3	2.6	3.5	3.9

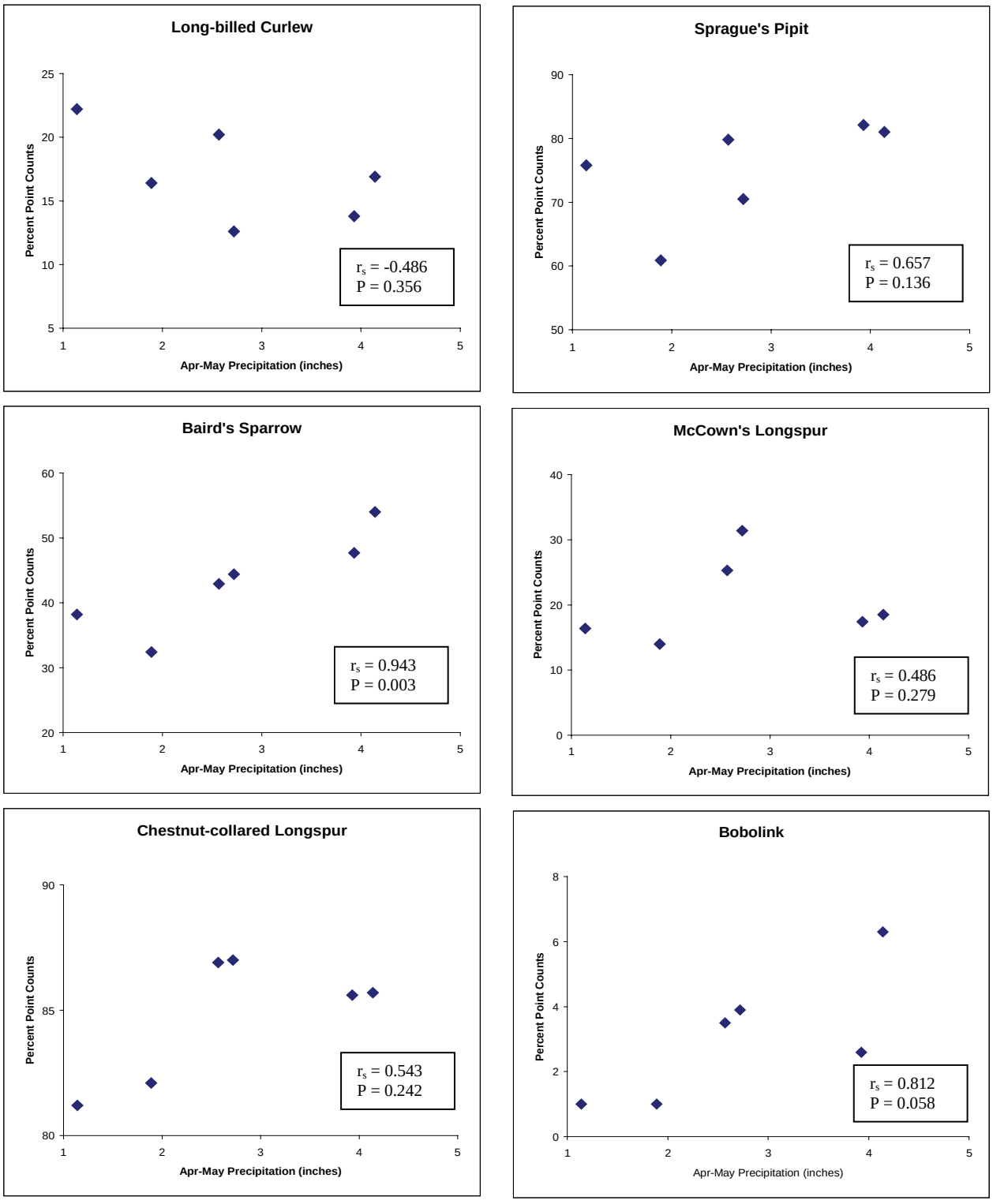

Figure 3. Spearman rank correlations between percentage of point counts on which a species was detected and April – May precipitation (2001 – 2006), for six Species of Concern occurring each year on north Valley County point counts.

unexpected. This species selects vegetation denser and taller than that favored by the longspurs, but also relatively shrub-free (Johnsgard 2001), so a pattern somewhat similar to Sprague's Pipit (Table 4, Figure 3) was anticipated.

All species recorded are likely to breed in or near the project area as field inventory occurred during the breeding season and observations included singing males and territorial displays in appropriate breeding habitat. Nest observations were not part of the survey protocol and have not been summarized at this time. The Montana Bird Distribution database (Lenard et al. 2003, MBD 2006) confirms breeding or indicates indirect evidence of breeding for the project area in Valley County for most of the species observed during this project. Direct evidence of breeding (nests with eggs or nestlings, or recently fledged dependent young) was confirmed for a number of species (see Appendix C for examples). Nests have been found for seven of the nine annually-occurring Species of Concern (Table 3, Figure 2); documented nests are lacking so far for Grasshopper Sparrow and Bobolink.

Conclusions

North Valley County is an exceptionally rich example of native grassland, representing some of the most intact remaining prairie in Montana (Redmond et al. 1998) and the entire North American continent. The area, which lies adjacent to Canada's Grasslands National Park, is recognized nationally and internationally for its importance to prairie-dependent species (Cooper et al. 2001, Smith Fargey 2004). Seven of the most abundant species recorded during this project (Table 3, Figure 2) are state Species of Concern (MTNHP and MTFWP 2006). Five are Great Plains prairie endemic birds (Samson and Knopf 1996) and are present at greater abundances here than other regions in Montana (Cooper at al. 2001). The extent of this area makes it especially important to species with very limited breeding distributions, such as the McCown's Longspur (With 1994), Baird's Sparrow (Green et al. 2002) and Sprague's Pipit (Robbins and Dale 1999), and those species dependent upon larger blocks of land, such as Baird's Sparrow, Bobolink, and Marbled Godwit (Johnson and Igl 2001, Dechant et al. 2003f).

While the historical combination of bison, pronghorn, elk, locusts, and fire that created a wide range of site conditions is long past, land management activities can mimic characteristics of this historically heterogeneous landscape by creating areas with low, sparse vegetative structure to those with taller, denser vegetation (Gillihan and Hutchings 2000). Each of these habitat conditions is suited to individual prairie-dependent species. Primary prairie endemics generally have more restricted breeding ranges with less flexibility in habitat requirements than more generalist species (Davis et al. 1999). It is important to recognize the subtle differences in foraging and breeding habitat requirements for each species when land management activities are considered. Providing suitable foraging and breeding sites to a diverse assemblage of avifauna will require a mosaic of vegetation characteristics likely to be beneficial to a host of other prairie species. Appendix B identifies some of the important characteristics of each Species of Conservation Concern recorded during this project.

SUMMARY/RECOMMENTATIONS

The present diversity and abundance of prairie-endemic bird species in north Valley County suggests that habitat elements in this area may be closer to historical conditions than other areas in the state. In addition, the different habitat requirements favored by each species recorded during this study suggest that a wide range of habitats are available. Given modern rangeland management objectives to remove approximately half of the annual growth through grazing (Adams et al. 2004, Holechek et al. 2003), it is not surprising that Sprague's Pipits and Chestnut-collared Longspurs, which show a preference for areas with moderate grass cover and litter, (Hill and Gould 1997, Robbins and Dale 1999, Dechant et al. 2003g) were two of the most commonly encountered birds during this study. It is encouraging to note, however, that both Baird's Sparrows, which require dense grass and litter (Green et al. 2002, Dechant et al. 2003b), and McCown's Longspurs, which require sparse grass and bare ground (With 1994, Dechant et al. 2003j), were also two of the most numerous bird species detected.

The current manageable activity affecting remaining native grasslands is grazing by livestock. In contrast to concerns that current grazing practices do not provide a range of habitats, management in north Valley County appears to be providing habitat suitable to a diversity of prairie endemic species. At primary issue, however, is whether current management activities address grassland bird population objectives and if current conditions are sufficient to sustain these prairie species long term. Although this landscape was shaped by thousands of years of grazing by bison, the effect of domestic cattle grazing on vegetation structure and density can differ markedly from that of bison (Peden et al. 1974, Schwartz and Ellis 1981). However, grazing effects of cattle and bison can be similar at the right scale. This scale is dependent, certainly, upon the species in question and the ability of land managers to address habitat elements specific to each species. Maintaining both grazing and other natural disturbance (e.g. fire) regimes that mimic the frequency and intensity of historic conditions will result in a mosaic of vegetation structures. These conditions are critical to supporting high species diversity; without them many species would likely disappear from this landscape. North Valley County is critical to the conservation of Montana's grassland bird species. Continued work is needed, however, to identify the impacts of current land management practices on the future of these unique species.

Detailed analysis on this dataset will be conducted in future years to identify the relationships between pasture grazing regimes and bird distribution, diversity, and abundance. The intent of this analysis is to identify how differences in vegetation structure, as a result of different grazing timing and intensity affect bird abundance patterns. Preliminary analyses of relationships between the abundance of some bird species and spring precipitation (Table 4, Figure 3) suggest that vegetation structure is likely a significant factor influencing the distribution and abundance of several grassland species of conservation concern. With additional analyses of grazing intensity and vegetation measurements on point-count circles, we expect to understand the relationship of birds to vegetation structure more clearly, and this will help guide grazing prescriptions in the future. Summary information on grazing history, bird abundance, and vegetative characteristic for each point and transect from the existing dataset are available in Microsoft Excel format and are electronic appendices to this progress report.

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APPENDIX A. GLOBAL/STATE RANK DEFINITIONS

HERITAGE PROGRAM RANKS

The international network of Natural Heritage Programs employs a standardized ranking system to denote global (range-wide) and state status. Species are assigned numeric ranks ranging from 1 to 5, reflecting the relative degree to which they are "at-risk". Rank definitions are given below. A number of factors are considered in assigning ranks — the number, size and distribution of known "occurrences" or populations, population trends (if known), habitat sensitivity, and threat. Factors in a species' life history that make it especially vulnerable are also considered (e.g., dependence on a specific pollinator).

GLOBAL RANK DEFINITIONS (NatureServe 2003)

G1	Critically imperiled because of extreme rarity and/or other factors making it highly vulnerable to extinction
G2	Imperiled because of rarity and/or other factors making it vulnerable to extinction
G3	Vulnerable because of rarity or restricted range and/or other factors, even though it may be abundant at some of its locations
G4	Apparently secure, though it may be quite rare in parts of its range, especially at the periphery
G5	Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery
T1-5	**Infraspecific Taxon** (trinomial) —The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank

STATE RANK DEFINITIONS

S1	At high risk because of extremely limited and potentially declining numbers, extent and/or habitat, making it highly vulnerable to extirpation in the state
S2	At risk because of very limited and potentially declining numbers, extent and/or habitat, making it vulnerable to extirpation in the state
S3	Potentially at risk because of limited and potentially declining numbers, extent and/or habitat, even though it may be abundant in some areas
S4	Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern
S5	Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range

COMBINATION RANKS

G#G# or S#S#	**Range Rank**—A numeric range rank (e.g., G2G3) used to indicate uncertainty about the exact status of a taxon

QUALIFIERS

NR	Not ranked
Q	**Questionable taxonomy that may reduce conservation priority**—Distinctiveness of this entity as a taxon at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority (numerically higher) conservation status rank

X	**Presumed Extinct**—Species believed to be extinct throughout its range. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered
H	**Possibly Extinct**—Species known from only historical occurrences, but may never-the-less still be extant; further searching needed
U	**Unrankable**—Species currently unrankable due to lack of information or due to substantially conflicting information about status or trends
HYB	**Hybrid**—Entity not ranked because it represents an interspecific hybrid and not a species
?	**Inexact Numeric Rank**—Denotes inexact numeric rank
C	**Captive or Cultivated Only**—Species at present is extant only in captivity or cultivation, or as a reintroduced population not yet established
A	**Accidental**—Species is accidental or casual in Montana, in other words, infrequent and outside usual range. Includes species (usually birds or butterflies) recorded once or only a few times at a location. A few of these species may have bred on the one or two occasions they were recorded
Z	**Zero Occurrences**—Species is present but lacking practical conservation concern in Montana because there are no definable occurrences, although the taxon is native and appears regularly in Montana
P	**Potential**—Potential that species occurs in Montana but no extant or historic occurrences are accepted
R	**Reported**—Species reported in Montana but without a basis for either accepting or rejecting the report, or the report not yet reviewed locally. Some of these are very recent discoveries for which the program has not yet received first-hand information; others are old, obscure reports
SYN	**Synonym**—Species reported as occurring in Montana, but the Montana Natural Heritage Program does not recognize the taxon; therefore the species is not assigned a rank
*	A rank has been assigned and is under review. Contact the Montana Natural Heritage Program for assigned rank
B	**Breeding**—Rank refers to the breeding population of the species in Montana
N	**Nonbreeding**—Rank refers to the non-breeding population of the species in Montana

Appendix B. Species of Conservation Concern: Natural History and Management

Species Name Species Status	General Habitat Characteristics	Nest Site Characteristics	Management Recommendations to Promote Species	Notes	Arrival Date Departure Date	Nesting Dates	Incubation Period Days to Fledging	Number of Broods	Primary Summer Diet	Secondary Summer Diet
Low to Intermediate Grassland Cover Associated Species										
McCown's Longspur[1] prairie endemic G5/S2B	Open sparse grassland; areas structurally similar to heavily grazed pastures.	Ground nester. Shallow depression in the ground: either in the open or beside vegetation.	Maintain short, sparsely vegetated native prairie. Moderate to heavy, or season long grazing can make mixed-grass prairie suitable.	Limited shrubs in area are suitable; Nestlings suffer high rates of (mammalian) predation.	late April mid-August	early May to late July	12 days 10-12 days	2	seeds/plant material	insects
Chestnut-collared Longspur[2] prairie endemic G5/S3B	Sparse; recently grazed, mowed, or burned; minimal litter.	Ground nester: often protected on south and east sides	Keep native pastures intact. Manage for fairly short vegetation with sparse litter accumulation.	Native prairie specialist. Areas with occasional shrubs suitable.	mid-April late September	early May to late July	10-13 days 9-14 days	2	insects	seeds
Lark Bunting[3] prairie endemic G5/S3B	Primarily short-to-mid grass prairie. Prefers areas with some shrubs. Generally prefers areas $\geq$ 10 km^2.	Ground nester. Nest placed next to/under various plant species	Provide areas of short vegetation with protective cover for nesting.	May be present in agricultural fields, but use is limited. Highest densities in native prairie, though will nest in CRP lands.	early May late August	Mid-May to mid-August	12 days 8-9 days	1 to 2	insects	secondary seeds/plant material
Long-billed Curlew[4] prairie endemic G5/S2B	Open sparse grassland preferred; taller, denser grass during brood rearing.	Ground nester. Nest is a scrape in the ground lined with various bits of vegetation, pebbles, and other organic matter.	Provide large, open level to gently rolling grasslands with short vegetation.	Generally avoids areas with high density of shrubs.	early April mid-September	mid-to late April	28-31 days (able to leave nest within hours of hatching) 32-45 days	1	carnivorous (terrestrial invertebrates, vertebrates, eggs, etc.)	-

AOU Code Species Status	General Habitat Characteristics	Nest Site Characteristics	Management Recommendations to Promote Species	Notes	Arrival Date / Departure Date	Nesting Dates	Incubation Period / Days to Fledging	Number of Broods	Primary Summer Diet	Secondary Summer Diet
Sprague's Pipit[5] prairie endemic G4/S2B	Intermediate height with moderate litter.	Ground nester; dense, grassy, relatively tall vegetation, minimal forbs present, little bare ground	Provide native prairie with intermediate vegetation height and low visual obstruction.	Avoids areas with shrubs.	early May / mid-September	late May to mid-July	13-14 days / 9-12 days	2?	almost entirely insects	very minimal seeds/plant material
Ferruginous Hawk[6] prairie endemic G4/S2B	Prefer open prairie and shrubsteppe habitat.	Exposed: on cliffs, trees, ground, or manmade structures.	Provide/protect suitable nest sites, protect active nest areas from disturbance, and improve habitat for prey.	Prefers flat, rolling terrain. Avoids high elevation, forested areas and narrow canyons. Avoids areas recently altered for cultivation	March / late September	late April to mid-July	28-33 days / 44-48 days	1	small mammals (inc. jackrabbits, cottontail rabbits, ground squirrels, and prairie dogs)	birds, reptiles, insects
Swainson's Hawk[7] G5/S3B	Grasslands, sparse shrublands, and small open woodlands,	Nest in deciduous trees (about 50% of nests reused).	Provide open grasslands with occasional trees for nesting and perching.	Species unique in switching from primarily small mammal diet to insects after young birds fledge.	mid-March / early November	early May to mid-July	28-35 days / 30 days	1	mainly vertebrates during breeding season (mammals, birds, & reptiles)	invertebrates at other times
Intermediate to Tall Grassland Cover Associated Species										
Grasshopper Sparrow[8] G5/S3B	Prefers moderately open grasslands with patchy bare ground. Generally avoids areas with extensive shrub cover, although some shrub cover is desirable.	Ground nester: nest often domed with grasses and side entrance.	Provide/protect large areas of contiguous grassland of intermediate height with moderately deep litter cover and low shrub density.	May be locally abundant, generally rare throughout range. Somewhat area sensitive. Moderate-to-high nest predation.	early May / early September	mid-June to late July	11-12 days / 8-9 days	2 (poss. 3)	insects	rarely seeds/plant material in summer

Species Name Species Status	General Habitat Characteristics	Nest Site Characteristics	Management Recommendations to Promote Species	Notes	Arrival Date Departure Date	Nesting Dates	Incubation Period Days to Fledging	Number of Broods	Primary Summer Diet	Secondary Summer Diet
Baird's Sparrow[9] prairie endemic G4/S2B	Ungrazed to moderately grazed, generally with litter depth of ~2 cm.	Ground nester; shallow scrape at base of grass clump.	Provide areas of native grassland (or idle tame pastures) with moderately deep litter. Avoid excessive grazing and limit shrub encroachment.	Scattered low shrubs and residual vegetation from last year are preferred habitat; area sensitive (favors large parcels). Nesting densities change according to local habitat conditions.	mid-May early September	late May to late July	11-12 days 8-10 days	1	insects	seeds/plant material
Bobolink[10] G5/S2B	Tall grass, flooded meadows, prairie. Most suitable habitat is moderate-to-tall vegetation, moderate-to-dense vegetation and moderately deep litter.	Ground nester: often located in wet habitats, often at the base of large forbs.	Provide large areas of native and tame grasslands of moderate height and density with adequate litter.	Somewhat area sensitive. Highly susceptible to nest abandonment if disturbed during breeding season.	mid-May early September	mid-June to late July	11-13 days 10-11 days	1	insects	seeds/plant material
Brewer's Sparrow[11] G5/S2B	Suitable breeding habitat contains dense shrubs, generally sagebrush. Average height generally <1.5 meters.	Nests built in taller, dense sagebrush, with limited bare ground and herbaceous cover.	Maintain extensive areas of sagebrush-dominated shrublands with average shrub cover of 10-30%, average shrub height of 0.4-1.5 m, and an understory of native grasses and forbs.	Can tolerate up to 3 weeks without water while on seed diet.	early May late September	late May to mid-July	10-12 days 8-9 days	2	insects	secondary seeds/plant material
Loggerhead Shrike[12] G4/S3B	Open prairie, pastures with fencerows, agricultural fields, riparian areas.	Usually well-hidden in crook of deciduous tree or robust shrub.	Provide grassland habitat with scattered trees and shrubs for foraging, nesting, and perching.	Lacking talons, may impale dead prey on barbed wire, branch, or thorn for easier consumption.	late April early September	mid-June to late July	16-17 days 17-21 days	2 broods possible	insects	small vertebrates, carrion

Species Name Species Status	General Habitat Characteristics	Nest Site Characteristics	Management Recommendations to Promote Species	Notes	Arrival Date Departure Date	Nesting Dates	Incubation Period Days to Fledging	Number of Broods	Primary Summer Diet	Secondary Summer Diet
Greater Sage-Grouse[13] G4/S3	Sagebrush communities; generally prefers larger-stature sagebrush, but will use other habitats during the non- breeding season including meadows and grasslands.	Ground nester: nest generally placed under sagebrush. Depression lined with grass and sagebrush leaves.	Maintain expansive stands of sagebrush (*Artemisia* spp.), with forb understory; open sites for leks; and perennial grass and forb stands intermixed with sagebrush for brood rearing.		permanent resident	mid-April to late July	25-27 days 7-10 days	1	forb buds and flowers	-
Wetland Associated Species										
Franklin's Gull[14] G4G5/S3B	Extensive prairie marshes with emergent vegetation.	Nest is a floating mat of reeds anchored to suitable emergent vegetation (bulrush important). Colonial nester.		Highly susceptible to human disturbance while nesting. Water must be present at wetland at time young fledge.	late Apri late September	early June to early July	24-25 day 32 days	1	Insects, worms	small vertebrates, other invertebrates, grains/ seeds
Common Tern[15] G3S3B	Open water bodies with islands for nesting.	Nests colonially; ground nester. Nest is a scrape in the ground generally lined with organic material.		Generally, nesting sites are sparsely vegetated.	mid-May late September	early June to late July	21-27 days 26-27 days	1, rarely 2	Fish	Aquatic invertebrates/ insects
Marbled Godwit[16] BLM Sensitive species	Short, sparse to moderately vegetated uplands for nesting and foraging. Wetland complexes for foraging.	Ground nester. Nests in wet and dry areas of wet meadow, upland areas of short (<30 cm) grass.	Provide large expanses of short, sparse to moderately vegetated native grasslands with wetland complexes.	This species may be area sensitive, rarely occurring on blocks of contiguous grassland <100 ha. Territories are large and include both feeding and nesting areas	early May early September	mid-May to early July	21-23 days 21 days	?	Aquatic invertebrates	Insects

Species Name Species Status	General Habitat Characteristics	Nest Site Characteristics	Management Recommendations to Promote Species	Notes	Arrival Date Departure Date	Nesting Dates	Incubation Period Days to Fledging	Number of Broods	Primary Summer Diet	Secondary Summer Diet
Willet[17] BLM Sensitive species	Short native grasslands idle during the nesting season. Prefer shallow-water wetlands with sparse vegetation.	Ground nester: nest often near a conspicuous object such as a piece of wood, a rock, or dried cattle dung.	Provide large expans-es of native grass-lands and wetland complexes		late April early October	Mid-May to mid-June	22-29 days 27-31 days	1	Aquatic in-vertebrates	-
Wilson's Phalarope[18] BLM Sensitive species	Both fresh and alkali wetlands with open water, emergent vegetation, and open shoreline.	Ground nester: nests are placed on the ground in wetlands, wet meadows and in grasslands adjacent to wetlands.	Provide suitable wet-land with open water, emergent vegetation, and open shoreline in addition to upland habitat throughout the breeding season.		mid-April early September	early May to late July	18-27 days Younng leave nest within 24 hrs of hatching. Actua days to fledging unknown	1, occ. 2	Aquatic in-vertebrates	seeds

1 - With 1994, Dechant et al. 2003j
2 - Hill and Gould 1997, Dechant et al. 2003c
3 - Shane 2000, Dechant et al. 2003m
4 - Dugger and Dugger 2002, Dechant et al. 2003i
5 - Robbins and Dale 1999, Dechant et al. 2003g
6 - Bechard and Schmutz 1995, Dechant et al. 2003l
7 - England et al. 1997, Dechant et al. 2003a
8 - Vickery 1996, Dechant et al. 2003d
9 – Johnson & Igl 2001, Green et al. 2002, Dechant et al. 2003b
10 - Martin and Gavin 1995, Dechant et al. 2003k
11 - Rotenberry et al. 1999, Ehrlich et al. 1988
12 – Yosef 1996, Dechant et al. 2003e
13 - Rowland 2004, Ehrlich et al. 1988
14 - Burger and Gochfeld 1994, Ehrlich et al. 1988
15 - Nisbet 2002, Ehrlich et al. 1988
16 - Dechant et al. 2003f, Ehrlich et al. 1988
17 - Lowther et al. 2001, Dechant et al. 2003h
18 - Colwell and Jehl 1994, Ehrlich et al. 1988

Appendix C. Example Nests Found During Surveys

a) Horned Lark nest

b) Sprague's Pipit nest

c) Lark Bunting nest parasitized by Brown-headed Cowbird

d) Chestnut-collared Lonspur nest parasitized by Brown-headed Cowbird

e) Western Meadowlark nest